

This Article was presented June 21, 2001
at the Purdue Forage Day

Getting Water From Here to There - True Stories

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Delivering clean water in the needed volume per day to Management Intensive Grazing (MIG) systems can be a challenge. Each situation should be analyzed to determine which methods of pumping and delivery could be used to insure that water is not a limiting factor during grazing.

Analyze resources

Review the number of acres in the pasture, the forage to be utilized, and animals per acre and whether a suitable water source is nearby. Possible water sources are, a well, a pond, a stream, rural water or natural springs.

Measure the horizontal distances to be covered when delivering water. Experienced graziers and researchers suggest a maximum traveling distance for animals to walk to water should be kept below 700 feet. Optimum distances reported by researchers vary from 450 to 650 feet. This will vary with species, forage, climate and terrain. The grazer is then challenged to deliver water over these distances in any adequate volume.

Also consider the vertical distance the water will move. The higher the fall in gravity systems, the more pressure is available to move water over undulating pastures. Pumping water up hill requires adequate pump capacity to overcome the added friction loss along with the friction loss in the rest of the system.

Establish goals

Develop your goals for grazing and be prepared to make changes as your knowledge base increases. Once the number of animals is estimated per pasture, calculate the water needed per pasture, determine if the water is available for that area and if more than one pasture will be served by the same water source. Domestic water systems may not provide adequate volumes during peak water use and still supply the home with the pressure or volume to operate appliances. Water can be stored in tanks for daily use and refilled overnight when domestic needs are low, but this may stress pump or capacities requiring more frequent maintenance. If the water source is not adequate to serve the pasture(s), cut back the number of animals and make some hay.

Design and select materials

Pumping, piping and the pot to put it in. The water system should be designed to refill the water tanks in an acceptable time frame. *Watering Systems for Grazing Livestock* by Bartlett, Great Lakes Basin Grazing Network and Michigan State University presents useful guidelines for design. For example, size the tanks and delivery system to recharge the tanks based on pumping from 4 to 12 hours maximum per day and 15 gallons per day for cow-calf pairs. Other species require more or less water per head.

Larger tanks can be used where flow rates are lower while smaller portable tanks can be utilized where flow rates refill the tank quicker. Smaller tanks also allow some mobility in the system and can be moved with the animals.

Consider if the system will be permanent or portable, 9 months or all-season, and what to do if the system fails. Installation of supply lines and tanks should be considered after determining the grazing layout. Some or all of the supply line could be buried or a combination of surface and buried supply line could be buried to allow future flexibility if the layout is changed.

Permanent or portable tanks and/or fixed waters can be used as a system to provide flexibility and winter use. Fixed water can be supplied by gravity or via a pump, but consideration for preventing freeze-up should be made during installation. Ground source heat, propane heaters, and secondary, thermostatically controlled flow valves to prevent freeze-up can be used where watering locations are remote and electricity is not cost effective.

Surface lines should be located so the minimal disturbance occurs during hay making, fertilization or spraying. Proper drainage around permanent tanks should be addressed during installation. Geotextile cloth and 4 to 6 inches of stone sloped away from the tank in a 20-foot radius can provide firm footing and reduce muddy conditions around the tank.

Delivery system components:

- Pumps
 - Gas-diesel powered pumps
 - Solar powered pumps
 - Stream powered pumps
 - Nose pumps
 - Electric pumps
 - Hydraulic ram pump
- Gravity
- Hauling water by wagon or truck
- Piping
 - PVC
 - High or low-density polyethylene

- Steel
 - Connections
 - Quick connections
 - Frost proof hydrants
 - Permanent connection
 - Float Valves 3/8" to 2"
 - Intake screens for surface water sources
 - Tanks
 - size needed vs. portability vs. all-season use
 - Storage tanks
 - gravity vs. pumped
 - concrete
 - fiberglass
 - polyethylene
 - steel
 - Pressure regulators on rural water systems.

Daily - Water System Maintenance

In MIG, you should be moving the animals frequently so take the time to examine the water system. Keeping records and monitoring the water system especially during hot, dry periods will give you the information needed to evaluate the installation. Watch how the animals drink and measure how long the tank takes to refill. On surface water sources, monitor the water intakes to be sure the intake is in the proper depth in the pond or stream. Inspect surface pipes for leaks, valves for debris and algae in the tank. Review the season and determine if the system needs modification.

Annual - Water System Maintenance

Water systems serving livestock can be designed to survive the abuse and daily wear animals impose. The obvious damage to tanks and controls can be corrected. Problems that develop over time such as water intakes becoming plugged with algae, tadpoles and debris, cracked supply lines or corroded pipes creep up slowly and diminish water flow over time. Not until a hot July day do we realize a problem might exist. A few preventative maintenance measures can eliminate many of these situations.

1. Pressurize line or open gravity systems before the pasture is occupied. Inspect for leaks in above and below ground installations.
2. Inspect valves and controls for leaks or plugging - low flow water sources or ponds may not withstand wasting of water and be able to supply throughout the season.
3. Gravity systems from surface water sources have the potential for moss algae, insects or small animals to enter the intake. A lesson taken from dry fire hydrant maintenance is to back flush annually to remove this debris. Old intake pipes may not be fitted to allow a backflushing operation.

- Rebuilt or new systems offer the opportunity to include a removable cap on a stand pipe or a spring-loaded or weighted flap over the end of the intake that will allow backflushing with clean water to clean debris from the screen. Backflushing requires a pump, clean water source such as a portable tank or a suction line into the pond and a point where a connection can be made to introduce the flushing water.
4. Re-evaluate your tank size, location and float valves. If problems existed last year with water volume or flow and the supply lines are adequate, revisit the tank size used. Does it provide enough capacity for the animals to drink freely? Low-flow/low pressure water sources may not provide rapid refill capacity to utilize small tanks. Overly large tanks may become algae filled and reduce animal consumption. Portable locations need to be flexible to minimize bare muddy areas and allow some recovery of the forage between grazing cycles. If the water supply was adequate and the tank was the right size and refill time is not what it should be, examine the float valve. Smaller valves up to 3/4" in diameter work well with pressurized water systems. Larger float valves, up to 2", are available and cost from \$25 to \$45. Also, a larger valve is less likely to become plugged by debris when using a surface water source and an intake strainer.
 5. Water source maintenance is also important. Public water sources are monitored and require minimal maintenance if these is available. Ponds, springs and streams are the most susceptible to contamination. Water quality publications on protecting private wells, livestock, and sampling water for testing can be found at <http://persephone.agcom.purdue.edu/AgCom/Pubs/WQ/WQ-1.pdf> and <http://www.agry.purdue.edu/ext/forages/rotational/watering/watering.html>.

After careful review of resources, additional help from CES educators, NRCS personnel and successful graziers can help in the final grazing layout and water system design. Notes and drawings of the layout on a soils map from the local CES or NRCS office or topographical map from the USGS (http://edcwww.cr.usgs.gov/Webglis/glisbin/finder_main.pl?dataset_name=MAPS_LARGE) can help others visualize initial concepts and provide a valuable reference if repairs are needed to buried wires.

Example Water systems

Southern Indiana Purdue Agricultural Center (SIPAC)

At SIPAC, four situations offered opportunities to develop water delivery systems. Each system relies on a pond for the water source, but they differ in the mode of delivery, gravity + gas pump and gravity + electric pump or solar pump+gravity.

Fields 1a and 1b

These two fields are roughly 50 acres in size and 42 cow-calf pairs were split between MIG and conventional system. The first system relies on a renovated gravity standpipe installed through the dam and down to a 1000-gallon watering tank. The elevation change provides for approximately 12-15 psi. and 10+ gpm.

This tank serves two to three paddocks of a nine-paddock design. The other part of the water delivery system in these fields is comprised of a gas powered pump, supply lines on the surface of the ground and storage tanks to gravity feed small water tanks. The 3.5 HP gas powered pump lifts the water about six feet and then pushes it up to an 1100 gallon storage tank. The supply line to the tanks is two-inch collapsible blue vinyl hose. It is laid under a perimeter fence 750' up to the storage tanks. Each watering point is connected to the two-inch hose by a one-inch, 160 psi. rated high density polyethylene pipe.

Field 2

This 22-acre field is an alfalfa-orchardgrass mix and the water system layout is similar to the two previous fields except a solar powered pump fills the water storage tank. This pump provides 3.5 gpm at 40 psi. Backup batteries supply power on cloudy days and the 110-gallon storage tank holds about two days of water for the 16 cow-calf pairs.

Fields 6a, 6b, and 9

These fields total 50 acres and 35 cow-calf pairs were split between an MIG and conventional system. The pond-fed gravity water supply in these fields is similar to the system in Field 1a and 1b except this system also supplies a smaller portable tank. This is accomplished through a 1-inch surface line laid on the contour in Field 6A and serves five of the paddocks.

The conventionally grazed areas are served by 1000-gallon tanks fed by the pumped-pond system. The pumped-pond system also services feed lots and adjacent dry lots located as much as one mile from the pump. A high efficiency stainless steel pump operating on 240 volts delivers 22 gpm vs. 11.5 gpm delivered by the old system at the same lift, pressure and amperage.

Feldun Purdue Agricultural Center (FPAC)

At FPAC, two areas presented opportunities for MIG management. The water systems considered at FPAC had been proposed for and discussed prior to the MIG projects as permanent installations that could service MIG or conventional management systems.

Oldham

A rented pasture of approximately 165 acres was served by a well through one automatic waterer or by access to Salt Creek. With 40 cow-calf pairs, the estimated maximum water needs would be around 660 gallons per day in the summer. This would require the pump to operate about 66 minutes per day delivering 10 gpm. Portable tanks were sized in the MIG paddocks to provide 150 gallons of water and a refill time of 15 to 18 minutes.

Fields 15-21

A rural water district is the other water source installed at FPAC. It was installed to augment sinkhole ponds with gravity fed watering tanks. Pressure at the main line is 130 psi and ranges from 85 to 105 psi. in the pastures. Pressure regulators are needed to lower the pressure within a range that the float valves can handle. Surface or shallow lines have been laid to access the paddocks within each field. Cattle travel about 650 to 700 feet to drink in the MIG paddocks.

Scholer Farm

The Scholer Farm does not have ponds that could provide adequate water and wells cannot be developed in the area. This left a spring as the candidate for the water source. The water source provides 15 gpm and there are over 600 acres that could be grazed. A French drain to a concrete septic tank was buried near the spring and a submersible pump was installed in the tank. The pressure tank and controls were installed in a building approximately 200' away and 70' above the water source. From the pressure tank, water is piped to the east pastures through 6700 feet of 2-inch diameter SDR 21 PVC pipe. The watering tanks and piping were sized so the pump runs no more than 12 hours per day that would provide 10,800 gallons per day for animal use at 15 gallons per animal.